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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/866,313	05/24/2001	Anisul Khan	AM 5230	4319

32588 7590 02/26/2004

APPLIED MATERIALS, INC.  
2881 SCOTT BLVD. M/S 2061  
SANTA CLARA, CA 95050

EXAMINER
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DEO, DUY VU NGUYEN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 02/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/866,313

Applicant(s)

KHAN ET AL.

Examiner

DuyVu n Deo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 4-6, 8-11 and 14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4-6, 8-11, 14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 4-6, 8-11, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hopkins et al. (US 6,187,685) and Paterson et al. (US 6,566,272).

Hopkins describes a method of anisotropically etching openings in silicon with SF<sub>6</sub> (col. 2, line 61-67; col. 12, line 21-35) in a chamber w/ a powered substrate support (col. 11, line 1-10) while applying pulsed bias power to the substrate support electrode during the etch step (col. 2, line 38-60); over-etching the silicon (col. 3, line 23-24; col. 7, line 48-55). Unlike claimed invention, he doesn't describe applying the pulsed bias power to the substrate support electrode while over-etching the silicon.

Paterson describes a method for providing pulsed plasma in a semiconductor wafer processing system where he teaches applying pulsed bias power to the substrate support electrode (col. 1, line 58-col. 2, line 5). It would have been obvious to one skill in the art to modify Hopkins method in light of Paterson because Paterson teaches doing that would minimize damage to circuits formed on the wafer as a result of charging and greatly reduces electron hading and other undesirable effects of wafer processing with plasma (col. 1, line 63-67).

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Referring to claims 6 and 14, Hopkins shows the method comprises of alternately etching and depositing a passivation layer using C<sub>4</sub>F<sub>8</sub> (col. 2, line 33-36; col. 6, line 60-col. 7, line 21). Since this is a cyclic process, this would include claimed step of depositing is done before the etching step and would read on claimed depositing step using fluorocarbon or hydrofluorocarbon gas before the overetching.

Referring to claim 11, Hopkins shows the etching step is done with SF<sub>6</sub>, which read on claimed of etching is carried out in the absence of oxygen.

Referring to claims 9 and 10, Hopkins shows the pressure is 17 or 55 mT and there is no bias during the deposition step (col. 7, line 10-12, line 20-22).

Referring to claim 2, Hopkins shows the applied bias power is 8-17 W (col. 7, line 7, line 16).

Referring to claims 4 and 5, Hopkins shows the duty cycle is of 10-90% (this would include claimed 10-80% or 35%) and teaches that the pulse width (claimed period) and duty cycle required depends on the bias frequency and the RC time constant associated with the charge build up on the oxide time interface (col. 3, line 42-44). Therefore, it would have been obvious for one skill in the art to determine the period and the duty cycle through routine experimentation depending on other processing parameters as described above by Hopkins in order to obtain optimum the period and the duty cycle for etching the silicon with a reasonable expectation of success.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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4. Claims 2, 4, 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is unclear "the applied bias power to the substrate support electrode" in claims 2, 4, and 5 applies to the one during the step of anisotropically etching openings in silicon or to the step of overetching. At the time, it will be understood as applied to the step of anisotropically etching openings in silicon.

***Response to Arguments***

5. Applicant's arguments with respect to claims 1, 2, 4-6, 8-11, 14 have been considered but are moot in view of the new ground(s) of rejection.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Dec whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-3:30; with alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DVD

2/18/04

*JD*